STUDY OF TEC FLUCTUATIONS IN ANTARCTIC IONOSPHERE DURING STORM USING GPS OBSERVATIONS

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Abstract

GPS observations carried out at Antarctic stations belonging to the IGS network were used to study TEC fluctuations in the high-latitude ionosphere during storms. Dual-frequency GPS phase measurements along individual satellite passes served as raw data. Ionospheric irregularities of a different scale develop in the auroral and polar ionosphere. This is a common phenomenon which causes phase fluctuations of GPS signals. We distinguished TEC variations related to ionospheric structures of a spatial scale bigger than 200-300 km. In the diagram of temporal variations of TEC along satellite passes, the structure of TEC corresponds to a time scale longer than 15-30 min. We attribute the variations in a time scale smaller than 15-30 min to TEC fluctuations related to small-scale ionospheric irregularities. We used the rate of TEC index (ROTI) expressed in TECU/min as a measure of TEC fluctuations. Large-scale ionospheric structures cause an increase in horizontal gradients and difficulties with the carrier phase ambiguity in relative GPS positioning. In turn, the phase fluctuations can cause cycle slips. At polar stations MCM4, CAS1, DAV1 we detected ionospheric structures of TEC enhanced 3-5 times relative to the background, whereas TEC increased to 10-30 TECU in about 10-15 min. The structures were observed during a storm, as well as during moderate geomagnetic activity. The structures can be probably attributed to polar cap patches.
During storms the intensity of phase fluctuations increased. The occurrence of phase fluctuations was even detected during the active storm period of 31 March 2001 at a middle-latitude station OHIG (located at 49° corrected geomagnetic latitude).

**Key words:** ionosphere, total electron content, ionospheric storms.